REMARKS

Claims 1-28 are pending in this application and stand rejected. The specification has been amended. Claims 1, 8 and 15 are independent.

The Objection to
the Specification

The specification was objected to on grounds the expression "blue laser light source 1b" at page 11, line 11, should read --blue laser light source 1c--.

The Examiner is thanked for calling attention to this point. The specification has been revised as the Examiner suggested. Accordingly, favorable reconsideration and withdrawal of this objection is respectfully requested.

The Rejections Under
35 U.S.C. § 103

Claims 1-23 were rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 5,317,348 to Knize in view of U.S. Patent No. 5,796,771 to DenBaars et al. Applicant respectfully traverses this rejection and submits the following arguments in support thereof.

The present invention, as set out in claim 1, involves a color laser display having a red laser light source for emitting red laser light, a green laser light source for emitting green laser light, a blue laser light source for emitting blue laser light, modulation means for modulating the red, green, and blue laser light, based on red, green and blue image signals, and a screen for displaying red, green, and blue when irradiated with the red, green and blue laser light. A projection means projects the red, green and blue laser light onto the screen so that an image, carrying the red, green, and blue image signals is displayed on the screen. An excitation solid laser unit, having a solid-state laser crystal doped with Pr^{3+} and a GaN semiconductor laser

element for exciting the solid-state laser crystal, serves as at least one of the red, green or blue laser light sources.

Applicant's invention, as described in claim 8, concerns a color laser display having a red, green and blue laser light sources for emitting red, green and blue laser light, respectively, a modulator for modulating the red, green and blue laser light based upon red, green and blue image signals, and a screen for displaying red, green, and blue when irradiated with the red, green and blue laser light.. A projector projects the red, green and blue laser light onto the screen so that an image, carrying the red, green, and blue image signals, is displayed on the screen. A fiber laser unit, having a fiber with a Pr^{3+}-doped core and a GaN semiconductor laser element for exciting the fiber serves as at least one of the red, green or blue laser light sources.

Claim 15 relates to a color laser display that includes red, green and blue laser light sources for emitting, respectively, red, green and blue laser light, a modulator for modulating the red, green and blue laser light based upon red, green and blue image signals, a screen for displaying red, green, and blue when irradiated with the red, green and blue laser light, and a projector for projecting the red, green and blue laser light onto the screen so that an image, carrying the red, green, and blue image signals is displayed on the screen. A semiconductor laser unit serves as at least one of the red, green or blue laser light sources, and the semiconductor laser unit includes an excitation light source constructed of a semiconductor laser element employing a GaN semiconductor in its active layer, and also includes a surface-emitting semiconductor element for emitting laser light when excited with the excitation light source.

The remaining rejected claims, claims 2-7, 9-14 and 16-23, all ultimately depend from and so incorporate by reference all the features of claims 1, 8 or 15, including those features which will now be shown to avoid the cited art. These claims are therefore patentable over that art at least for the same reasons as their respective base claims.

As discussed in the specification, since the solid state laser crystal doped with Pr does not employ a wavelength conversion device (SHG), it is possible to generate a visible light

with both high efficiency (10-20% for the SHG laser vs. 30-50% for the present invention in view of the light-light conversion efficiency) and high output. Therefore, a laser display with high efficiency in view of the light-light conversion efficiency can be realized by using the solid state laser crystal doped with Pr. As a result, by virtue of the present invention it is possible to realize a laser display with high brightness but low power consumption.

Knize generally teaches a solid state laser projector system employing RGB laser beams. However, Knize does not teach using a solid state laser crystal doped with Pr, in the manner claimed. As the Examiner **admits**, Knize also does not teach a laser unit in which the fiber laser includes gallium nitride (Office Action, p. 3, ¶ 3). Moreover, Knize only states that the green laser is a fiber laser doped with material such as Pr, and consequently, does not suggest that the other lasers (red and blue) also might include Pr.

DenBaars teaches a solid state laser in which a GaN-LD is used in order to excite a laser crystal doped with Pr. However, Applicant submits that DenBaars does not teach a laser crystal doped with Pr, which emits red laser light, green laser light and blue laser light, unlike the present invention.

DenBaars teaches using a semiconductor made from In, Ga, AI, P, N and As as a light source for excitation. DenBaars merely teaches obtaining a light source for excitation, which produces the light ranging from 200 to 620nm by using, for example, $AI_xGa_yIn_{1-x-y}N$.

Applicant also submits that in a high efficiency laser (such as a semiconductor laser made with ZnSe) which does not employ wavelength conversion as taught by Knize, it is not possible to obtain a laser light source having a high output power, on the order of a watt.

Applicant further submits that, as mentioned in the specification, according to the present invention, it is possible to realize a laser display with low noise while a solid state laser employing a wavelength conversion element generates noise due to a conflict of longitudinal modes.

In view of the foregoing arguments, it is Applicant's position that the claimed invention would not have been obvious in view of DenBaars and Knize. Therefore, the outstanding ground of rejection is improper, and so favorable reconsideration and withdrawal of this rejection are respectfully requested.

Claims 24-28 were rejected under 35 U.S.C. § 103 as being unpatentable over Knize in view of DenBaars as previously applied to claim 15, and further in view of U.S. Patent No. 5,727,016 to Paxton. Applicant respectfully traverses this rejection and submits the following arguments in support thereof.

Claims 24-28 all ultimately depend from and so incorporate by reference all the features of claim 15, including those features which already have been shown to patentably distinguish over Knize and DenBaars.

Paxton is only cited as teaching the output of a surface emitting semiconductor laser is spatially coherent if the width of the lasing region is limited to about 5 microns, and that the width could be increased to about 50 microns. Regardless of whether that is so, it remains that Paxton in no way suggests the aspects of the invention already shown to avoid the other cited art. Accordingly, claims 24-28 patentably distinguish over the cited combination of references for the same reasons this invention avoids Knize and DenBaars alone.

For all the foregoing reasons, favorable reconsideration and withdrawal of this rejection are respectfully requested.

CONCLUSION

Applicant respectfully submits that all outstanding objections and rejections have been addressed and are now either overcome or moot. Applicant further submit that all claims pending in this application are patentable over the prior art. Reconsideration and withdrawal of those rejections and objections is respectfully requested.

Favorable consideration and prompt allowance of this application is respectfully requested. In the event that there are any questions, or should additional information be required, please do not hesitate to contact applicant's attorney at the number listed below.

Respectfully submitted,

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Attachment: "Version With Markings to Show Changes Made"

Version With Markings to Sh w Changes Made

IN THE SPECIFICATION:

The paragraph beginning at page 11, line 8, has been amended as follows:

As illustrated in Fig. 1, the color laser display has a red laser light source 1a for emitting red laser light 10R, a green laser light source 1b for emitting green laser light 10G, a blue laser light source [1b] 1c for emitting blue laser light 10B, a first optical modulator 2a for modulating the red laser light 10R on the basis of a red image signal, a second optical modulator 2b for modulating the green laser light 10G on the basis of a green image signal, and a third optical modulator 2c for modulating the blue laser light 10B on the basis of a blue image signal.